Short Form Work Paper WPSDGEREWH0022

**Revision 2**

**San Diego Gas & Electric**

**Energy Efficiency Engineering**

**Residential Heat Pump Water Heater**

**November 15, 2017**

# SDG&E Residential Heat Pump Water Heater

## Introduction

This short form workpaper (WP) documents the updates from E-4867 DEER impacts and costs.

## Document Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| **Rev** | **Date** | **Author** | **Summary of Changes** |
| 0 | 02/28/13 | Charles Harmstead | - Initial Workpaper |
| **1** | **09/23/14** | **Phillip Hasley (Hasley Consulting)** | - Adopted SCE Work Paper SCE13WH001.1  - Removed calculation template  - Updated savings calculations to use DEER 2008 2.05 and 4 water heater sizes  - Updated delivery mechanism to include direct install  - Updated EUL\_ID  - Updated NTG  - Added GSIA  - Updated load shapes  - Updated building types  - Updated costs to be based on DEER |
| 1.1 | 05/21/2015 | Phillip Hasley (Hasley Consulting) | - Updated NTG  - Added Lookup ID Summary Table  - Added PreRebUp as a delivery method |
| 2 | 11/15/17 | Kelvin Valenzuela (SDG&E) | - Updated kWh, kW impacts to E-4867  - Remove offerings other than 50 gallons  - Measure 1 changed from 40 gallons to 50 gallons @ EF = 3.24  - Measure 2 changed from 50 gallon to 50 gallons @ EF = 3.50  - Electric Profile changed for single family implementations |

## Measure Summary

Table : Measure Summary Table

| **Section** | **Value** |
| --- | --- |
| **Summary & Purpose** | This short form workpaper documents ex-ante load impacts and cost-effectiveness values for Residential Heat Pump Water Heaters. The base energy consumption and measure energy consumption values are from READi v.2.4.7. Costs are from SDG&E Marketplace. |
| **1.1 Measure & Baseline Data** | Measure:  464085 – Small storage HP water heater EF = 3.24 (UEF = TBD): Small storage electric gallon replacement (EF = 0.95)  464086 – Small storage HP water heater EF = 3.50 (UEF = TBD): Small storage electric gallon replacement (EF = 0.95) |
| **1.2 Technical Description** | Conventional electric-resistance water heaters usually consist of a glass-lined steel tank with foam insulation. Energy efficient units have a greater amount of insulation. Located at the base and top end of the tank are two electrical heating elements. Cold water enters the base of the tank and is heated by the lower electrical heating element. The water then rises to the top portion of the tank. This is where the hot water is drawn for consumption. During periods of high demand, the electrical heating element located at the top end of the tank can be turned on to provide additional water heating.  Heat pump water heaters heat water using a heat pump, allowing them to achieve much higher efficiency (energy factor), compared to electric-resistance water heaters. Similar to electric-resistance water heaters, most heat pump water heaters consist of a glass-lined steel tank with foam insulation. Heat pump water heaters are typically equipped with supplemental electric-resistance elements for periods of high demand. |
| Measures | See Requirements |
| Code for All Measures | The measures in this work paper are considered small water heaters. A small water heater can be defined as an ESWH with an input of 12 kW or less, or a HPWH rated at 24 amps or less. The following codes apply to the measures in this work paper:  **Title 20 (2016) [508]**  Section 1605.1(f)(2) provides minimum Energy Factor requirements for ESWHs and HPWHs:   |  | | --- | |  |   **Title 24 (2016) [496]**  Section 110.1 references the requirements set in Title 20.  **Federal Standards – Code of Federal Regulations [393]**  The Code of Federal Regulations, 10 CFR 430.32(d) provides requirements for ESWHs but not HPWHs. Title 20 follows the federal code.    Note: Beginning June 12th, 2017, EF ratings were replaced with the new industry standard for measuring energy efficiency in water heaters, known as the Uniform Energy Factor (UEF). However, Title 20, The Code of Federal Regulations, and DEER 2017 are still using EF and have not been updated yet. Energy Star currently has certification requirements for either EF or UEF. This work paper and the associated solution codes will continue to use EF until code switches to UEF.    **Code Summary**   |  |  |  | | --- | --- | --- | | **Code** | **Applicable Code Reference** | **Effective Dates** | | Title 24 (2016) | Section 110.1 Mandatory Requirements for Appliances | January 1, 2017 | | Title 20 (2016) | Section 1605.1(f)(2) | January 1, 2017 | | Code of Federal Regulations | 10 CFR 430.32(d) | April 16, 2015 | |
| Requirements |  |
| **1.3 Installation Type and Delivery Mechanisms** |  |
| Installation Type | Replace on Burn-out (ROB) |
| Delivery Mechanisms | Downstream Rebate – Deemed |
| **1.4.1 DEER Data** | RE-WtrHt-SmlStrg-HP-lte12kW-rep50G-3p24EF  RE-WtrHt-SmlStrg-HP-lte12kW-rep50G-3p50EF |
| Net-to-Gross Ratio | Res-Default>2yrs (0.55) |
| Effective and Remaining Useful Life | WtrHt-HtPmp (EUL = 10 Years) |
| **Section 2. Calculation Methodology** | Savings values were taken directly from DEER 2017 [49] using the READI Tool v2.4.7 and are included in the table below. These results have not been modified and are only being included in the work paper for reference. |
| Energy Savings/Peak Demand Reduction – All Measures | 464085 – Small storage HP water heater EF = 3.24 (UEF = TBD): Small storage electric gallon replacement (EF = 0.95)  Screen Clipping  464086 – Small storage HP water heater EF = 3.50 (UEF = TBD): Small storage electric gallon replacement (EF = 0.95)  Screen Clipping |
| **Section 3. Load Shapes** | SDGE: 26-SFM-ResidentialSingleFamily-WAT\_HEAT Annual |
| **Section 4. Costs** | Base costs were collected through SDG&E’s Marketplace data of current industry electric water heaters rated @ 0.95. Measure costs were collected from SDG&E installs in 2017. |
| **Section 4.1 Base and Measure Costs** |  |
| Base Cost | 464085:  WPSDGEREWH0022-Rev02-Msr001-BASE = $508.26  464086:  WPSDGEREWH0022-Rev02-Msr002-BASE = $508.26 |
| Measure Cost | 464085:  WPSDGEREWH0022-Rev02-Msr001-FULL = $1,132.00  464086:  WPSDGEREWH0022-Rev02-Msr002-FULL = $1,099.00 |